well established, even without great accuracy of data, that among civilized nations color-blindness is at present almost equally common.

Second, among uncivilized people, Dr. Favre's results from Algiers, already alluded to, show 414 examined, and only 2.6 per cent. color-blind.

Dr. Fox reports 161 young Indians tested, and only 1.81 per cent. color-blind.

These percentages, so low compared with those for civilized people, suggested to us that color-blindness may be a product of civilization, and have led to our tests here reported.

At the Haskell Institute, at Lawrence, Kansas, are several hundred Indians, representing many tribes. These we have recently examined by Holmgren's method with Berlin worsteds. Out of 418 tested—285 males and 133 females—only three cases of color-blindness exist, or only .7 of one per cent. These three are full-blooded Indians of the Pottawatomie, Pawnee and Crow tribes. Of these, two have defective color-sense for red and one for green.

The Indians of the School are about equally divided as full-bloods and half-breeds. It seemed to us that the half-breeds showed more instances of blunted color-sense than the full-bloods. This was evidenced in more frequent and prolonged hesitation among them in comparing the colors than among the full-bloods.

If this be confirmed by more extended examinations, it would, in conjunction with the low percentages obtained as above, be an argument on the theory proposed by us, that defective color-vision is in some way the product of civilization.

The use of tobacco suggests itself as a possible cause. This would explain also the low percentage among females. It leads also to the thought of increase of color-blindness in males in future generations. But the data are at present too meager to more than suggest this explanation.

It is certainly not accidental that nearly every case of color-blindness is for red, few for green, and seldom one for violet. Why are the defects thus limited, at present at least, to the longer wave-lengths of light?

The Young-Helmholtz theory of color-perception will locate the affection in that layer of the retina corresponding to the first of the three primary sensations of color. But why this special layer, with few exceptions, is the only one affected, has at present no explanation.

The law of heredity indicates increasing sensitiveness in those nerves which are subjected to special use through many generations. It seems reasonable that this must lead to a more perfect color-sense in females; but among males there will probably be an increase, in future generations, of the number of cases of defective color-sense.

PHYSICAL LABORATORY, November 1, 1888.

STATISTICS ON COLOR-BLINDNESS AMONG THE STUDENTS AT THE STATE AGRICULTURAL COLLEGE.

BY C. M. BREESE,

Kansas State Agricultural College, Manhattan.

The test used in conducting this experiment was that known as the Holmgren method. The operator had tumbled a great number of small pieces of yarn of all the various colors and shades obtainable, in one pile. These we will term the yarns of confusion. A yarn of a pure, light-green color was given the person to be examined, and he was asked to select from the colors of confusion several pieces of yarn

which resembled this in color—different shades of it—lighter and darker than the one to be selected to. Care was taken by the operator not to call the name of the color. The student was not asked to select different shades of green, but to select yarns with a shade of "that color." The reason for this is plain. It is true that one-half the color-blind students had another name for the color than green, and they might be needlessly alarmed if they were to discover their catalogue of colors differed from that of the operator. If the person being tested selected as many as a dozen different shades from the colors of confusion, with no hesitation and no mistakes, he was dismissed and regarded as normal in color-sight. If, however, there was an evident uncertainty, a hesitation, an apparent lack of confidence in his judgment, he was given a further trial, even though no mistakes were made. If the person tested selected one or more colors to match the green with no shade of green in them, a further test was given on other colors. This further test is for the purpose of determining on what particular colors the eyesight is deficient, for it is seldom that color-blindness extends so far as to render the subject totally color-blind—although a few such cases have been met with.

The results are given by classes, as that seemed the most natural classification that could be made.

The class of '88 contained 26 members, two of whom were incompletely color-blind. They both confused the brown yarns with the green. I give the colors one selected to match the green: Green 16, brown 7, orange 1.

The class of '89 contained 47 members, all of normal sight.

The class of '90 contained 78 members, two of whom were completely color-blind. One of them selected green 3, red 6, pink 3 to match the green; the other, green 8, red 3, brown 2.

One of these, the first one, called the green and red and pink, shades of green. He was red-blind; knew no such color as red. The other called them red. He was green-blind.

The class of '91 contained 185 members. Four were completely color-blind, and four incompletely color-blind. Of the completely color-blind, two were red- and two were green-blind. Two were brothers, one red- and one green-blind. A sister and several cousins were all normal. Of the incompletely color-blind, three confused blue and green and one brown and green.

The class of '92 contained 208 members. One was completely color-blind—red-blind—and three were incompletely color-blind, all confusing blue with the green.

SUMMARY.

Total number examined, 544.
Total number completely color-blind, 7.
Total number incompletely color-blind, 9.
Per cent. deficient, 3—.
Per cent. completely color-blind, 1.3—.

A COMPARISON OF THE RECORDS OF THE TWO ANEMOMETERS AT THE UNIVERSITY OF KANSAS.

BY PROF. F. H. SNOW, OF THE UNIVERSITY.

Until the erection of an anemometer by Professor Lovewell at Washburn College, the only anemometers in the State of Kansas were those at the State University, at Lawrence, and at the Signal-Service station, in the city of Leavenworth. The